

THE CONSEQUENCES OF MICROVARIATION IN EASTERN NILOTIC

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Overview of the talk

(1) Root control as rigid stem identity

In root-controlled vowel harmony, stem vowels never alternate to agree with affix vowels. I maintain that this is best analyzed as the rigid effect of a principle I call *stem identity*. This principle serves to maintain identity between $[\alpha]$ and $[[\alpha]\beta]$, where α is a (possibly complex) morphological stem of affixation and β is an affix.

(2) Emergent stem identity in Maasai and Turkana

I will present evidence that dominant-recessive $[\pm\text{ATR}]$ vowel harmony in two Eastern Nilotic languages, Maasai and Turkana, is also restricted by the stem identity principle. In dominant-recessive vowel harmony, stem vowels do alternate to agree with certain (so-called *dominant*) affix vowels, but in both Maasai and Turkana this alternation is blocked or absent in two sets of circumstances that together suggest the emergence of the usually subverted but otherwise extant stem identity principle.

(3) Further evidence for emergent stem identity in Turkana

In Maasai, all dominant vowels are $[\text{+ATR}]$. In Turkana, some dominant vowels are $[\text{+ATR}]$ and some are $[\text{-ATR}]$. This deceptively insignificant lexical difference produces no less than three additional sets of situations in which stem vowel alternation is blocked in Turkana, providing even more evidence for emergent stem identity.

(4) Definition of terms, as they are used here

- a. *Affix*: a (usually bound) morpheme that attaches to a (usually free) morphological constituent to create a larger constituent.
- b. *Stem (of affixation)*: any morphological constituent to which an affix may attach. (n.b.: Not to be confused with any more specific sense of *stem*.)
- c. *Root*: the innermost / least peripheral stem of affixation.
- a. *Less peripheral*: a morpheme x is less peripheral than another morpheme y if x is closer to the root than y : $\dots - \sqrt{\text{root}} - \dots - x - \dots - y - \dots$
- e. *More peripheral*: a morpheme x is more peripheral than another morpheme y if x is further from the root than y : $\dots - \sqrt{\text{root}} - \dots - y - \dots - x - \dots$

(9) Dominant-recessive vowel harmony

- a. In many African languages with [±ATR] vowel harmony — e.g., Kalenjin (Southern Nilotic; Tucker 1964, Halle & Vergnaud 1981) and Diola Fogy (Northern Atlantic-Congo; Sapir 1965, Ringen 1975) — some affix vowels can instigate harmony, causing less peripheral stem vowels to alternate.
- b. Harmony instigators are called *dominant*; undergoers are called *recessive*.
- c. Does this mean that stem identity is *inactive* in dominant-recessive vowel harmony? Not quite: Maasai and Turkana, which exhibit dominant-recessive vowel harmony, show a significant amount of evidence for stem identity.

2 Basic harmony facts of Maasai and Turkana

(10) Maasai/Turkana vowel inventory (tone/length/etc. ignored here)

	[-back]	[+back]	
i	ĩ	ũ	u [+high, -low]
e	ɛ	ɔ	o [-high, -low]
		ã	[-high, +low]

The boxed vowels (marked [ɿ]) are [-ATR]; the other vowels are [+ATR].

Notice that each vowel except for the [+low] vowel [ã] has a [±ATR] counterpart; [ã] is thus often *opaque* to [+ATR] harmony (though not always; see §3).

References. *Maasai*: Tucker & Mpaayei 1955, Hall et al. 1974, Wallace-Gadsden 1983, Levergood 1984, Cole 1987, Cole & Trigo 1988, Archangeli & Pulleyblank 1993, 1994, McCrary 2001. *Turkana*: Dimmendaal 1983, Hualde 1984, Vago & Leder 1987, Noske 1990, 1991, 1996, 2000, Albert 1995.

(11) Examples that might lead one to think that this is root-controlled harmony ...

a.	<i>Maasai</i>	[ki – √ĩorr – u]	‘we shall love’	
	<i>Turkana</i>	[ã – √gol – un]	‘to close’	[+ATR] roots, harmonizing affixes
b.	<i>Maasai</i>	[mi – ki – √itoki]	‘let us not do again’	
	<i>Turkana</i>	[ã – √rem – un]	‘to spear’	
c.	<i>Maasai</i>	[kĩ – √ĩdĩm – ũ]	‘we shall be able’	
	<i>Turkana</i>	[ã – √dɔk – un]	‘to climb’	[-ATR] roots, harmonizing affixes
d.	<i>Maasai</i>	[mĩ – kĩ – √rãñ]	‘let us not sing’	
	<i>Turkana</i>	[ã – √dɔk – un]	‘to hide’	

(12) [+ATR] dominant suffix vowels (boxed)

a.	<i>Maasai</i>	[$\sqrt{\text{isuj}} - \text{išə}]$	‘wash!/do the washing!’	
		[$\sqrt{\text{isuj}} - \text{išo} - \boxed{\text{re}}]$	‘wash with something!’	[+ATR] affixes,
b.	<i>Turkana</i>	[$\text{a} - \sqrt{\text{duk}} - \text{un}]$	‘to hide’	harmonizing roots
		[$\text{e} - \sqrt{\text{duk}} - \boxed{\text{e}}]$	‘way of hiding’	

(13) [-ATR] dominant suffix vowel (Turkana only!)

<i>Turkana</i>	[$\text{a} - \sqrt{\text{rem}} - \text{un}]$	‘to spear’	[-ATR] affix,
	[$\text{ɛ} - \sqrt{\text{rɛm}} - \text{ɛ} - \boxed{\text{rɛ}}]$	‘(why) is it speared?’	harmonizing root

3 Low vowels are opaque in one ‘direction’ and harmonic in the other

(14) Descriptive generalization

A [+low] vowel ([-ATR] by virtue of being [+low]) blocks [+ATR] harmony *only if it is less peripheral than a [+ATR] dominant suffix vowel*. Otherwise, a [+low, -ATR] vowel harmonizes to become [-low, +ATR].¹

(15) [+low, -ATR] ~ [-low, +ATR] alternations (*italicized*), showing that the alternation is triggered by [+ATR] root vowels, but not by dominant suffix vowels ...

a.	<i>Maasai</i>	[$\text{ɪn} - \sqrt{\text{ɪpɔŋ}} - \text{a}]$	‘full-grown female’	[-ATR] roots,
	<i>Turkana</i>	[$\text{ɛ} - \sqrt{\text{pɛg}} - \text{a:n} - \text{a}]$	‘kinship’	[+low, -ATR] vowels
b.	<i>Maasai</i>	[$\text{in} - \sqrt{\text{mudoŋ}} - \text{o}]$	‘s/he is argumentative’	[+ATR] roots,
	<i>Turkana</i>	[$\text{e} - \sqrt{\text{pup}} - \text{o:n} - \text{o}]$	‘s/he is obedient’	[-low, +ATR] vowels
c.	<i>Maasai</i>	[$\text{ɛ} - \sqrt{\text{ɪpɔt}} - \text{a} - \text{ri} - \boxed{\text{ie}}]$	‘it will get filled up’	*[$\text{e} - \sqrt{\text{iput}} - \text{o} - \text{ri} - \boxed{\text{ie}}]$
	<i>Turkana</i>	[$\text{ɛ} - \sqrt{\text{pɛg}} - \text{a:n} - \boxed{\text{u}}]$	‘denial’	*[$\text{e} - \sqrt{\text{peg}} - \text{o:n} - \boxed{\text{u}}]$

(16) Additional Turkana examples, showing that the alternation can in fact be triggered by a dominant affix vowel — *as long as it is less peripheral* than the low vowel.

a.	[$\text{nə} - \text{ɛ} - \text{a} - \sqrt{\text{mamaḱ}} - \text{a} - \text{ta} - \text{ri}]$	
	<i>since</i> – 3pl – TNS – <i>lack</i> – VOI – PL – SUB	‘since they were lacking’
b.	[$\text{pɛ} - \text{k} - \text{a} - \text{ɪs} - \sqrt{\text{ɪlɔt}} - \text{a:n} - \text{a} - \text{kin} - \boxed{\text{it}} - \text{o} - \text{to} - \text{ri}]$	
	NEG – K – 1sg – CAUS – <i>wash</i> – HAB – E – BEN – ASP – VOI – PL – SUB	‘that they did not force me to do the washing all the time’

(17) The emergence of stem identity

Low vowel opacity can profitably be understood as a case of *emergent stem identity*: a low vowel in a [-ATR] stem protects the stem from alternation due to a more peripheral [+ATR] harmony trigger, achieving stem identity. Opacity in a more peripheral position than a [+ATR] harmony trigger would *not* achieve stem identity, and so the fact that low vowels are harmonic in more peripheral positions is not unexpected.

(18) One apparent problem with the stem identity analysis

Low vowels are also opaque in prefixes. Dominant vowels in roots are less peripheral than prefixes, and so are dominant vowels in suffixes if suffixes are morphologically internal to prefixes: [*pref* [[*√root*] *suf*]]. From this perspective, a directional interpretation of the generalization in (14) (“to the left of” rather than “less peripheral” — Archangeli & Pulleyblank 1993, 1994; Albert 1995) appears to be superior.

However, because prefix vowels are never dominant (see §4 immediately below), what happens to a low vowel in a prefix when there is a dominant vowel preceding it, or one in a following prefix, simply cannot be tested. The problem thus amounts to the following: low vowels do not raise in prefixes in situations where they are expected to be based on the behavior of low vowels in suffixes. Therefore, the solution to this problem is to somehow limit the raising process to apply only in suffixes.

4 Prefix vowels are never dominant

(19) The problem of arguing from absence

No amount of static data will adequately show this negative fact, but the following sets of alternations in Turkana demonstrate the effect that this fact has on the prefixation of otherwise free morphemes. In each of these cases, a vowel (whose underlying [±ATR] value can be discerned when its morpheme stands as an independent word) alternates to agree with the [±ATR] value of a root to which it is prefixed. This can also be understood as a case of emergent stem identity: although root-to-suffix harmony is dominant-recessive, root-to-prefix harmony is root-controlled.

(20) Demonstrative prefixation

(Dimmendaal 1983:22)

- | | |
|-----------------------------------|---------------------|
| a. [<i>lu</i>] | ‘these (masc. pl.)’ |
| b. [<i>lu</i> – <i>√kilyok</i>] | ‘to the people’ |
| c. [<i>lɔ</i> – <i>√bɛrɔ</i>] | ‘(to the) females’ |

(21) Possessive pronoun incorporation (Dimmendaal 1983:344)

<i>GEN – √root # POSS</i>	<i>GEN – POSS – √root</i> (topicalized order)	<i>gloss</i>
a. [$\varepsilon - \sqrt{k\dot{\iota}r\dot{\zeta}} \# \sqrt{k\dot{o}n\dot{i}}$]	[$\varepsilon - k\dot{\zeta}n\dot{\iota} - \sqrt{k\dot{\iota}r\dot{\zeta}}$]	‘your name’
b. [$\eta\dot{a} - \sqrt{k\dot{i}} \# \sqrt{k\dot{\zeta}s\dot{\iota}}$]	[$\eta\dot{a} - k\dot{o}s\dot{i} - \sqrt{k\dot{i}}$]	‘our ears’
c. [$\dot{a} - \sqrt{m\dot{u}r\dot{o}} \# \sqrt{k\dot{\xi}\eta}$]	[$\dot{a} - k\dot{\xi}\eta - \sqrt{m\dot{u}r\dot{o}}$]	‘its hindleg’

(22) Adverb incorporation (relative clauses) (Dimmendaal 1983:309)

a. [$k - \dot{a} - \sqrt{\dot{\iota}d\dot{\xi}s} - \dot{\iota} \# e - \sqrt{d\dot{y}\dot{a}} \# \dot{a} - \sqrt{y\dot{\zeta}\eta} \# \sqrt{\eta w\dot{o}o\dot{n}\dot{i}}$]	
<i>Isg-hit # boy # Isg-pro # other-day</i>	‘the boy hit me <u>the other day</u> ’
b. [$e - \sqrt{d\dot{y}\dot{a}} \# l\dot{o} - w\dot{\zeta}\dot{\zeta}n\dot{\iota} - k - \dot{a} - \sqrt{\dot{\iota}d\dot{\xi}s} - \dot{\iota} \# \dot{a} - \sqrt{y\dot{\zeta}\eta}$]	
<i>boy # that-other-day-Isg-hit # Isg-pro</i>	‘the boy that I hit <u>the other day</u> ’

(23) Intensive reduplication (Dimmendaal 1983:107)

[$\dot{a} - i\dot{m}y\dot{e}l - \dot{i} - \sqrt{m\dot{y}\dot{\xi}l} - \dot{\iota} \# \dot{a} - \sqrt{y\dot{\zeta}\eta} \# \dot{a} - \sqrt{t\dot{a}p}$]	
<i>Isg-taste-INT # Isg-pro # porridge</i>	‘I am tasting the porridge’

4 Interim summary

Although affix vowels can be dominant in Maasai and Turkana and can thus cause harmonic alternations of less peripheral stem vowels, this more-to-less peripheral harmony is blocked or absent in two sets of circumstances — when there is a low vowel in the stem, or when the affix is a prefix — that together suggest the emergence of the usually subverted but otherwise extant stem identity principle. Emergent stem identity stops here for Maasai, but the [–ATR] dominant vowels unique to Turkana provide further evidence.

5 Raised low vowels don’t look back

(24) Low vowels that have raised due to less peripheral [+ATR] dominant vowels do not re-lower (as it were) in response to more peripheral [–ATR] dominant vowels in Turkana.²

a. [$\dot{a} - k - \sqrt{\dot{\iota}p\dot{y}\dot{d}} - \dot{a} - k\dot{\iota}n$]	‘to trample’
b. [$e - \sqrt{\dot{i}b\dot{u}s} - \dot{o} - k\dot{i}n$]	‘it has fallen down’
c. [$\varepsilon - \sqrt{\dot{\iota}b\dot{y}\dot{s}} - \dot{\zeta} - k\dot{\iota}n - \boxed{\dot{a}}$]	‘it has thrown itself down’ * [$\varepsilon - \sqrt{\dot{\iota}b\dot{y}\dot{s}} - \dot{a} - k\dot{\iota}n - \boxed{\dot{a}}$]

(25) Dimmendaal (1983:25) is very clear about what is going on here: “The correct surface forms can only be arrived at by assuming a cyclic process.”

- | | | |
|--|--|---------|
| a. Underlying form of stem | / $\xi - \sqrt{\text{ibus}} - \underset{\text{a}}{\text{a}} - \text{k}\underset{\text{a}}{\text{in}} /$ | |
| b. Harmony and raising ($\underset{\text{a}}{\text{a}} \rightarrow \text{o}$) | [$\text{e} - \sqrt{\text{ibus}} - \text{o} - \text{kin}$] | = (24)b |
| c. Dominant vowel suffixation | [[$\text{e} - \sqrt{\text{ibus}} - \text{o} - \text{kin}$] - $\boxed{\text{a}}$] | |
| d. Harmony, no lowering ($\text{o} \rightarrow \underset{\text{a}}{\text{a}}$) | [[$\xi - \sqrt{\text{ibus}} - \underset{\text{a}}{\text{a}} - \text{k}\underset{\text{a}}{\text{in}}$] - $\boxed{\text{a}}$] | = (24)c |

(26) OK, but what does cyclicity have to do with anything?

The cycle is just a particular formal mechanism that was intended in part to capture effects of stem identity. The point is that the stem to which the [-ATR] dominant suffix attaches contains the [-low, +ATR] vowel [o], and that there is no record that this vowel was originally [+low, -ATR] / $\underset{\text{a}}{\text{a}}$ /. The optimal blend of harmony and stem identity is thus a minimal change from the [+ATR] vowel [o] to the [-ATR] vowel [ɔ].

6 High vowels are opaque in one ‘direction’ and harmonic in the other

(27) Descriptive generalization

A [+high, +ATR] vowel blocks [-ATR] harmony *only if it is less peripheral than a [-ATR] dominant suffix vowel*. (n.b.: this holds only of Noske’s data; in Dimmendaal’s — maybe a different dialect — high vowels are harmonic in either ‘direction’.)

(28) An underlyingly [+high, -ATR] root vowel alternates

- | | |
|--|-----------------------|
| a. [$\underset{\text{a}}{\text{a}} - \sqrt{\text{dyk}} - \text{un}$] | ‘to hide’ |
| b. [$\text{e} - \sqrt{\text{duk}} - \boxed{\text{e}}$] | ‘way of hiding’ |
| c. [$\underset{\text{a}}{\text{a}} - \sqrt{\text{dyk}} - \xi - \boxed{\text{re}}$] | ‘(why) is it hidden?’ |

(29) An underlying [+high, +ATR] root vowel is opaque

- | | | |
|--|-----------------------|--|
| a. [$\underset{\text{a}}{\text{a}} - \sqrt{\text{buk}} - \text{un}$] | ‘to pour’ | |
| b. [$\text{e} - \sqrt{\text{buk}} - \boxed{\text{e}}$] | ‘way of pouring’ | |
| c. [$\underset{\text{a}}{\text{a}} - \sqrt{\text{buk}} - \xi - \boxed{\text{re}}$] | ‘(why) is it poured?’ | *[$\underset{\text{a}}{\text{a}} - \sqrt{\text{byk}} - \xi - \boxed{\text{re}}$] |

(30) A more peripheral [+high] suffix vowel alternates

- a. [$\sqrt{\text{vedo}} - \text{un} - \text{it}$] ‘she gave birth’
 b. [$\xi - \sqrt{\text{mɔn}} - \text{ɔn} - \text{ɪt}$] ‘it becomes hotter’
 c. [$\sqrt{\text{ilik}} - \text{ɔr} - \text{ɪt}$] ‘it is taken down’
 d. [$\text{e} - \sqrt{\text{duk}} - \text{ɔr} - \text{ɪt}$] ‘s/he builds over there’

(31) Empirical note #1

The aspectual suffix [-it~ɪt] in (30) is regularly recessive, alternating to agree with any root or dominant affix vowel that happens to be around. I have unfortunately found no examples of a *dominant* [+high] suffix vowel that is more peripheral than a dominant [-ATR] suffix vowel to see what would happen in such a case. However, the fact that the [+high] vowel of the aspectual suffix in (30) alternates to agree with the less peripheral dominant [-ATR] vowel cannot simply be due to its recessiveness:

(32) A less peripheral [+high] suffix vowel is opaque

- a. [$\text{k} - \text{a} - \sqrt{\text{sil}} - \text{i} - \text{kin} - \text{it}$] ‘I am lonely’
 b. [$\text{k} - \sqrt{\text{mɔrɪ}} - \text{a} - \text{kɪn} - \text{ɪt}$] ‘I have forgotten’
 c. [$\text{e} - \sqrt{\text{gol}} - \text{o} - \text{kin} - \xi - \text{rɛ}$] ‘(why) is it closed?’
 d. [$\sqrt{\text{iboy}} - \text{i} - \text{kin} - \xi - \text{rɛ}$] ‘(why) is it sat down?’ * [$\sqrt{\text{Ibɔy}} - \text{ɪ} - \text{kɪn} - \xi - \text{rɛ}$]

(33) Empirical note #2

Again, the benefactive suffix [-kin~-kɪn] is regularly recessive and I have been unable to find examples of a [+ATR] dominant suffix vowel that is less peripheral than a [-ATR] dominant suffix vowel. The opaque [+ATR, +high] suffix vowels in (32) are thus [+ATR] due to harmony with the [+ATR] vowels of the roots in these forms.

(34) Problems with a directional analysis

Unlike low vowels (cf. (18)), high vowels are *not* opaque in prefixes.³ A directional (“to the left of”) interpretation of the generalization in (27) is thus highly suspect.

Furthermore, the fact that both high and low vowels are sensitive in exactly the same way to the ‘direction’ of harmony demands explanation. Under the stem identity analysis, it is impossible for either or both to have the opposite sensitivity to ‘direction’. This is not so under a directional analysis, where at least both (if not either) can in principle be opaque when “to the right of” and harmonic when “to the left of” a harmony trigger. (On directionality and process-specificity, see McCarthy 1997.)

7 Glide insertion and opacity

(35) Descriptive generalization: a palatal glide [y] is inserted between a [-ATR] dominant suffix and an underived root with a [-high, +ATR] vowel, blocking [-ATR] harmony.

- | | | | | |
|----|---|-----------|-------|------------|
| a. | [ǻ – √pey – ɛt] | ‘bakery’ | √pe | ‘to roast’ |
| b. | [ǻ – √loty – ɛt] | ‘going’ | √lot | ‘to go’ |
| c. | [ǻ – √itemy – ɛt] | ‘attempt’ | √item | ‘to try’ |

It is unclear what to make of the morphological restrictions (i.e., that the root must be underived) and the phonological restrictions (i.e., that the root vowel must be [-high]) on this insertion process. However, the function that glide insertion serves appears to be stem identity: the root is protected from harmonic alternation by the inserted glide.

8 Concluding remarks

Under the stem identity view of apparent directionality effects in vowel harmony that I advocate here, the logical extreme of stem identity is root-controlled harmony, and the other extreme is pure dominant-recessive harmony.⁴ I like to think of the harmony facts in Maasai and Turkana as midpoints along this continuum, with less-to-more peripheral harmony targeting all vowels but more-to-less peripheral harmony targeting only a subset of the vowels, due to the emergent effect of stem identity in these languages.

The idea of stem identity was formally implemented in my dissertation (Baković 2000) in terms of Correspondence Theory, roughly following Benua 1997, Kager 1999ab, Kenstowicz 1996, among many others). Facts from languages with root-controlled vowel harmony as well as many of the Maasai and Turkana facts discussed here were analyzed there in terms of that formal implementation. My aim here has been to further motivate the idea of stem identity in vowel harmony, regardless of its formal implementation.

Notes

¹ Noske (1990 *et seq.*) argues that this alternation is due to a process that is completely independent of harmony (in Turkana), and McCrary (2001) argues that it is due to lexical allomorphy, but with allomorph selection still conditioned by harmony (in Maasai). If Noske’s analysis is correct, the argument here will have to be re-evaluated; McCrary’s analysis, on the other hand, appears to be entirely compatible with the point being made here.

² A caveat about the particular forms in (24): they’re Dimmendaal’s, not Noske’s. According to Noske, the example in (24)c would be [e – √ibus – o – kin – a], with [+high] vowel opacity (see §6 below). (Forms like these, but without intervening [+high] vowels, could in principle occur in Noske’s data; I simply do not have any such forms.)

³ To be fair, I have yet to find an example (in Noske’s data) of a [+high] prefix vowel followed by a [-ATR] dominant suffix vowel (as opposed to a [-ATR] root vowel) to fully test this claim.

⁴ Note that this other extreme is *not* affix-controlled harmony (*pace* Krämer 2001 on Fula (Paradis 1992)). I maintain that there is no *anti*-stem identity; only stem identity and the relative lack thereof.

References

- Albert, C. 1995. *Derived Environments in Optimality Theory: A Case Study in Turkana*. Ms., UCSC.
- Archangeli, D. and D. Pulleyblank. 1993. *Optimality, Grounding Theory, and Rule Parameters*. ROW-1.
- Archangeli, D. and D. Pulleyblank. 1994. *Grounded Phonology*. MIT Press, Cambridge.
- Baković, E. 2000. *Harmony, Dominance and Control*. Doctoral dissertation, Rutgers University. [ROA-360.]
- Benua, L. 1997. *Transderivational Identity: Phonological Relations Between Words*. PhD dissertation, University of Massachusetts, Amherst. [ROA-259.]
- Cole, J. 1987. *Planar Phonology and Morphology*. PhD dissertation, Stanford University.
- Cole, J. and L. Trigo. 1988. Parasitic harmony. In H. van der Hulst and N. Smith (eds.), *Features, Segmental Structure and Harmony Processes (Part II)*, 19-38. Foris, Dordrecht.
- Dimmendaal, G. J. 1983. *The Turkana Language*. Foris, Dordrecht.
- Hall, B. L., R. M. R. Hall, M. D. Pam, A. Myers, S. A. Antell, and G. K. Cheronon. 1974. African Vowel Harmony Systems from the Vantage Point of Kalenjin. *Africa und Übersee* 57, 241-267.
- Halle, M. and J.-R. Vergnaud. 1981. Harmony Processes. In W. Klein and W. Levelt (eds.), *Crossing the Boundaries in Linguistics*, 1-22. Reidel, Dordrecht.
- Hualde, J. I. 1984. *Vowel Harmony in Turkana*. Ms., USC.
- Kager, R. 1999a. Surface opacity of metrical structure in Optimality Theory. In B. Hermans and M. van Oostendorp (eds.), *The Derivational Residue in Phonological Optimality Theory*, 207-245. John Benjamins, Amsterdam.
- Kager, R. 1999b. *Optimality Theory*. Cambridge University Press.
- Kenstowicz, M. 1996. Base Identity and Uniform Exponence: Alternatives to Cyclicity. In J. Durand and B. Laks (eds.), *Current Trends in Phonology: Models and Methods*, 363-393. CNRS, Paris and University of Salford.
- Krämer, M. 2001. *Vowel Harmony and Correspondence Theory*. PhD dissertation, Universität Düsseldorf.
- Levergood, B. 1984. Rule Governed Vowel Harmony and the Strict Cycle. *NELS* 14, 275-293.
- McCarthy, J. 1997. Process-specific constraints in Optimality Theory. *LI* 28, 231-251. [ROA-114.]
- McCrary, K. 2001. *Low Harmony, ATR Harmony and Verbal Morphology in Kisongo Maasai*. Ms., UCLA. [To appear in *UCLA Working Papers in Phonology*.]
- Noske, M. 1990. Vowel Harmony in Turkana. *Studies in the Linguistic Sciences* 20.1, 123-134.
- Noske, M. 1991. Feature-changing Harmony in Turkana. In K. A. Hubbard (ed.), *Proceedings of the Berkeley Linguistics Society, Special Session on African Language Structures*, 166-176.
- Noske, M. 1995. *The Ternary Use of Distinctive Features: In Defense of the Number Three*. Doctoral dissertation, University of Chicago.
- Noske, M. 1996. [ATR] Harmony in Turkana. *Studies in African Linguistics* 25.1, 61-99.
- Noske, M. 2000. [ATR] Harmony in Turkana: A Case of FAITH SUFFIX » FAITH ROOT. *Natural Language and Linguistic Theory* 18, 771-812.
- Paradis, C. 1992. *Lexical Phonology and Morphology: The Nominal Classes in Fula*. Garland, New York.
- Ringen, C. O. 1975. *Vowel Harmony: Theoretical Implications*. PhD dissertation, Indiana University.
- Sapir, J. D. 1965. *A Grammar of Diola Fogy*. West African Language Monographs 3, Cambridge University Press.
- Tucker, A. N. 1964. Kalenjin Phonetics. In D. Abercrombie, D. B. Fry, P. A. D. MacCarthy, N. C. Scott and J. L. M. Trim (eds.), *In Honour of Daniel Jones*, 445-470. Longmans, London.
- Tucker, A. N. and T. ole Mpaayei. 1955. *A Maasai Grammar, with Vocabulary*. Longmans, Green and Co., London.
- Vago, R. M. and H. Leder. 1987. On the Autosegmental Analysis of Vowel Harmony in Turkana. In D. Odden (ed.), *Current Approaches to African Linguistics (vol. 4)*, 383-395. Foris, Dordrecht.
- Wallace-Gadsden, B. F. 1983. /a/ within the system of Maasai vowel harmony. *CUNYForum* 9, 21-40.

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